THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY.

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$3 PER ANNUM IN ADVANCE.

Wright & Smith's Vertical Steam Engine.

The steam engine represented in the accompanying cut is novel in some of its features, while retaining the long tried and admitted advantages of the ordinary form of Slide Valve Engines. The makers claim as the peculiar advantages of the form they adopt, the economy in space, low cost of the most effective power, convenience in working and keeping in order, economy in fuel by reduction of friction, ornamental form and finish, and the highest class of workmanship combined, with the best quality of material.

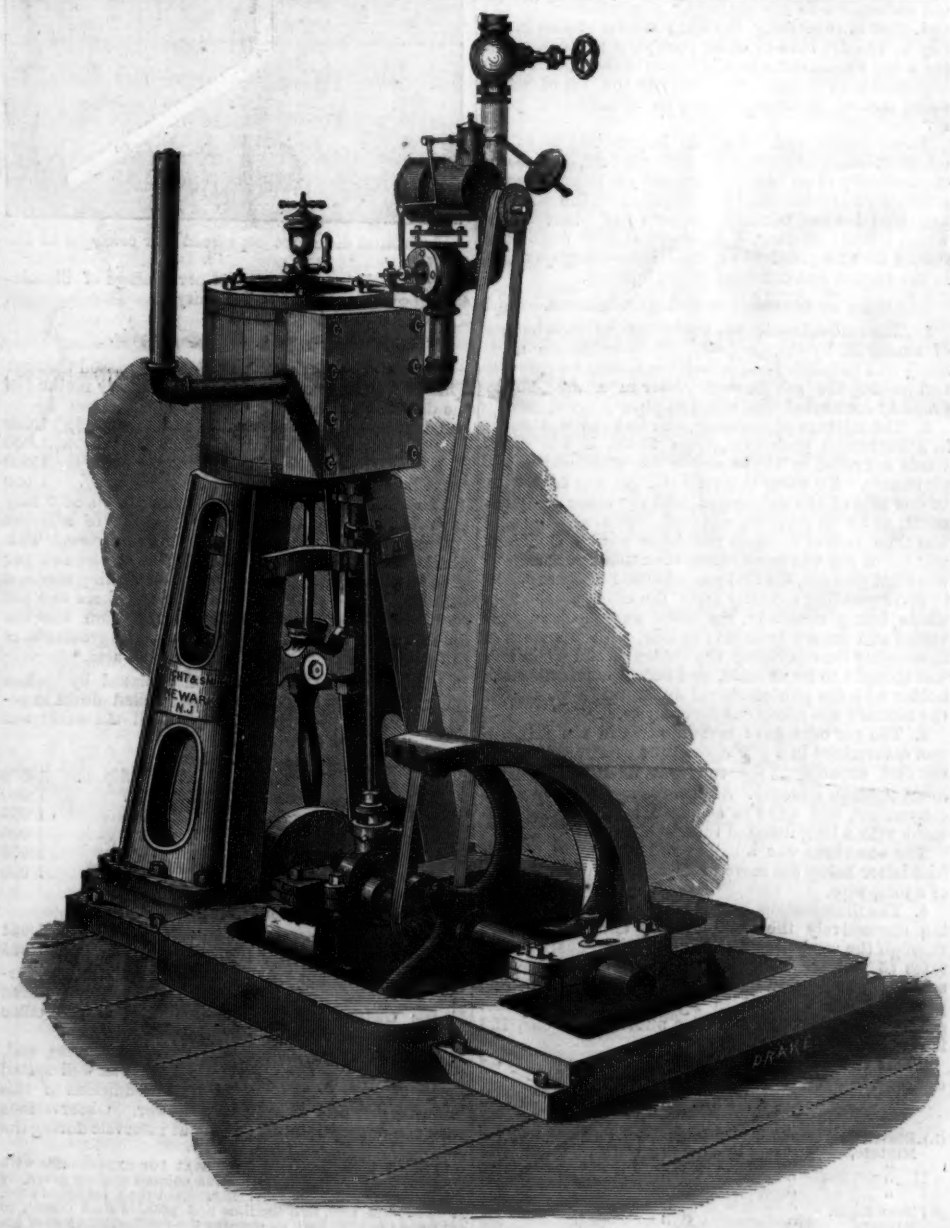
An advantage greatly appreciated by those who design an increase of business, consists in the fact by buying one of these engines with a single cylinder of the power they require; at any future time they can, at little expense and delay, attach an additional cylinder to the same bed, thus doubling the power without altering the bed of the engine or fixtures.

By referring to the cut it will be seen that the entire strain is central and cannot spring the parts of the engine under a heavy load. The engine is mounted on a solid bed-plate, supporting also both bearings of the crank shaft, and can be bolted to the floor or supported by masonry as the situation demands. The crank shaft, crank pin, connecting rod and slides are oiled by suitable self-oiling channels, which are supplied from oil cups furnished with the engine. An adjustable cut-off, actuated either by the governor or by hand, is applied to the larger sizes, by which the economy claimed in the use of steam expansively is gained. Vertical engines have been used for marine purposes for a long time, and in the excessive strain caused by the position they usually occupy, have given conclusive evidence of the superiority of this form for strength and durability.

Messrs. Wright & Smith were the first parties who introduced the Vertical Stationary Engine in any number, and some three or four yeart since placed them in the market. The success has been very marked, as within two years past over one hundred have been made and sold by them; a large number of which are in use in New York city in some of our largest establishments. Among other uses to which these engines have been applied, is that of furnishing power to Exhausters in gas works. By the use of two cylinders on the same bed plate, a much smoother running engine may be obtained; and in case of damage to one cylinder the other is always ready to continue the work.

The makers, Messrs. Wright & Smith, of Newark, N. J., have always on hand, or in the works, an assortment of sizes, and in their large establishment have ample facilities for completing orders rapidly.

Salesrooms W. L. Chase & Co., 93, 95 and 97 Liberty street, New York city.



Fishkill's New Gas Works.—The *Journal* says the parties who have purchased the gas works in that village, propose immediately to construct new works of the most approved kind, at Fishkill Landing. The mains will be extended to Matteawan, and perhaps, ultimately to Glenham and Fishkill. The works in that village will next month be thoroughly repaired, improved and enlarged. The company will thus be enabled to furnish a never failing supply of the best quality of gas. They will consequently deserve a liberal patronage from its citizens, and we hope to see the number of consumers increased. It is contemplated to establish street lamps. The price of gas will be further reduced at the earliest practicable period.

Chemical Repertory,

No. 55.—June 16, 1871.

EDITOR—HENRY WURTZ.

ON THE REDUCTION OF LIGHT DUE TO THE PRESENCE OF CARBONIC ACID IN ILLUMINATING GAS.

By FRED. E. STIMPSON.

[Read before the American Association for the Advancement of Science, Troy Meeting, August, 1870.]

It is a familiar fact that carbonic acid gas is incapable of burning, and that a flame of any kind plunged in an atmosphere containing a large amount of it is immediately extinguished. Its presence, therefore, in considerable quantity, in ordinary illuminating gas, might be expected to impair its illuminating power. But in the small proportion of 1 or 2 per cent., in which, at some manufactories, it is allowed to remain in the gas, the evil is so inconspicuous as to have led to the belief that a more complete removal of the impurity is pratically of no importance

The opinion has even been advanced, that in such small quantities its action is merely that of diluent, serving, when present in such gas, to facilitate the combustion, to the extent, at least, of compensating for the loss of light it might otherwise occasion.

These reasons in favor of an incomplete removal of the carbonic acid are moreover strengthened by the fact, that in separating the last portions of this impurity by the dry lime or other purifying process, we at the same time arrest a small portion of the illuminating ingredients of the gas, and thus run the risk of weakening instead of strengthening its illuminating power.

These vague and uncertain impressions as to the action of small quantities of carbonic acid, and as to the economy of its removal, suggest the importance of a thorough experimental investigation on the subject, and have led me to make the series of observations which follow; offering, I believe, the first conclusive results thus far published on this interesting question in the science and economy of gas lighting.

MODE OF CONDUCTING THE EXPERIMENTS.

1. The carbonic acid was evolved from bicarbonate of ammonia, by the action of dilute sulphuric acid, using the common form of self-regulating apparatus, and passing the gas through water in a wash-bottle properly connected with the exit-pipe.

2. The mixture of carbonic acid and gas was made in a diaphragm gasholder, from whidh it was afterwards delivered to the burner in the photometric experiments. To effect this mixture, gas was turned on to one side of the diaphragm, and the other compartment, as far as possible, emptied. The carbonic acid was then turned in upon the latter until a sufficient volume of gas was introduced, then this compartment was filled with gas, the first gas admitted being expelled in corresponding quantity from the other side. The whole being closed in, the vessel was repeatedly inverted and turned from side to side, with the view of thoroughly incorporating the contents, and when this was thought to be effected, and before connecting the holder with the photometrical apparatus, a portion of the mixture was taken out for analysis.

3. The per centage of carbonic acid in the mixture was determined in a graduated tube over mercury. In the first experiment the tube was filled by displacement through mercury. Afterwards it was found more convenient, and quite as accurate, to fill by displacement with a long inserted tube in air.

The absorbent was a ball or rod of caustic potassa (the latter being the more prompt), fixed upon the end of a long wire.

4. The illuminating power was determined by passing successively the common gas and the mixture through the same dry meter, at equal or nearly equal rates (5 feet per hour), and burning them from the same 15-hole Argand burner, and comparing their respective lights with a third light, also burning 5 feet per hour, at the other end of a photometric bar, 150 inches long.

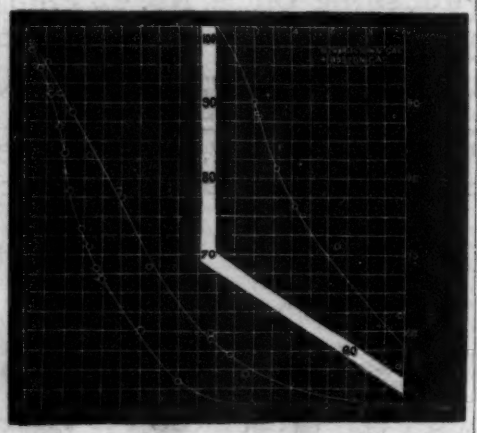
These two results were then reduced to equality of delivery.

Experiments.			CO_2	*Ill. Power.*
(1.) Boston gas, containing about			2.6 p. c.	1.000
Mixture,	"	by determination	24.	.903
"	"	"	26.6	.153
"	"	"	16.95	.400
"	"	"	8.75	.667
(2.) Boston gas,	"	"	2.5	1.000
Mixture,	"	"	12.5	.609
"	"	"	29.	.084
"	"	"	58.5	.000
(3.) Boston gas	"	"	2.50	1.000
Mixture,	"	"	24.	.193
"	"	"	12.	.619
(4.) Boston gas,	"	"	2.8	1.000
Mixture,	"	"	4.6	.903
"	"	"	4.4	.936
(5.) Boston gas,	"	"	2.4	1.000
Mixture,	"	"	3.3?	.921
"	"	"	5.8	.854

Note.—From the above we obtain the following table:—Allowing 2.6 per cent. = to produce a loss of 2.6 × ·0364 = .094 loss of light.

Pure Gas 0. Per Ct. C O_2.	Ill. Power=1000.	Loss.	Ill. Pow. for each Per Cent. Lost of per Cent. C O_2.
2·6 —	.906	.094	.
3·3? (4·3)	.840	.160	5
5·8	·779	·221	4
4·5	·820	·180	2
8·75	6.04	·396	4½
12·	·563	·437	3½
12·5	·554	·446	3½
16·25	·863	·637	3½
24·	·183	.817	3½
24·	·175	·825	3½
26·61	·137	·863	3½
29·	·076	·924	3½
58·5	·000	1.000	..

I have put these results in the form of a curve, and, for the purpose of comparison, have added a curve representing the loss due to the addition of atmospheric air, taken from Audouin and Berard's experiments.—*Annales des Chimie, &c.*, 1862.—F. E. S.



Horizontal distances represent per centages of impurity.

Vertical distances represent per centage of illuminating power, pure gas being unity.

O Curve of carbonic acid.

–O Represent curve of atmospheric air.

In the next experiments the gas was passed through hydrated lime, according to the ordinary method of the dry-lime process.

(6.) Boston gas, carbonic acid (undetermined)		1.000
The same purified through lime	"	1.060
(7.) Boston gas, carbonic acid, 2·2 per cent.		1.000
The same partially purified		1.030

The difference between experiments 6 and 7 may have been partly due to the presence of a larger amount of carbonic acid in the former case. This small effect on the illuminating power of the two per cent. of carbonic acid taken out, is in striking contrast with that observed in the former case, where two per cent. was added, and leads to the suspicion that the lime removes some of the illuminating ingredients at the same time that it abstracts carbonic acid.*

(8.) The lime was removed and replaced by broken fragments of pumice-stone, boiled down in solution of potassa (13 deg.) until the water was nearly all evaporated.			
Partially purified gas, carbonic acid		0·3 p. c.	1·070
Boston gas, carbonic acid		2·7	1·000
"	purified, car. acid	0.	1·055
(9.) "	"	2·7	1·000
"	purified "	0·5	1·073
(10.) Boston gas	"	2·58	1·000
Purified so that it did not act on baryta water while passing through for 5 minutes		0·	1·051
The same partially purified		1·61	1·035

These results not being altogether satisfactory, further experiments were made upon gas manufactured by the Charlestown Gaslight Company, in the office adjoining their works.

This gas was purified by the dry-lime process, and, being nearly free from carbonic acid, was well suited for determining the effect of small additions of this impurity on the illuminating power. Observations with the absorption-tube, made at intervals during the continuance of the experiments, gave the per centage of carbonic acid in the gas 0·3, 0·3, 0·2, 0·2.

The following table gives the results obtained by these experiments—pure gas being 1·000:

Per Cent. Carb. Acid in Gas.	Illuminating Power.	Loss of Ill. Power.	Loss p. c. Illum. for p. c. C O_2.
1·0	1·000	...	—
1·9	·900	·100	5·2
2·1	·888	·116	5·5
2·2	·878	·122	5·5
3·1	·814	·186	6·
4·2	·769	·231	5·5
6·6	·707	·293	4·4
6·7	·710	·290	4·3
9·7	·555	·444	4·5
9·7	·618	·318	3·9

From these results it would seem that at least 10 per cent. of the light was destroyed by the addition of 2 per cent. of carbonic acid; and it is but reasonable to expect that, if we could take out that 2 per cent. without removing any illuminating ingredient, there would be a corresponding gain.—*Jour. Franklin Institute, January.*

[ORIGINAL COMMUNICATION.]

GENERAL REMARKS ON NAPHTHA-GAS, INCLUDING PHOTOMETRY.

Report of HENRY H. EDGERTON, Superintendent, Fort Wayne Gas-Light Comdany.

[Concluded from page 147.]

Naphtha-gas is not as explosive as coal gas in one sense. It is not ignitable except by actual flame, or a powerful electric spark, as any one undertaking a number of analyses will attest. In nearly all cases detonating gas had to be added to produce an explosion, even when the gases were mixed in due proportion.

Coal gas is more easily ignited on account of presence of carbonic oxide.

The yield varied in my experiments between 59 and 80 cubic feet per gallon, though much larger yields are occasionally obtained. Though constructed with a view to determine exactly the maximum yield for the material, it was found that no satisfactorily uniform results could be obtained with such an experimental apparatus. Sometimes there was a loss of Naphtha by "vomiting" of still, occasionally the still gauge becomes choked, and I always found a small proportion of naphtha escaped the condensers.

The following are the most perfect experiments with their results annexed:

No. 5.

Benzine in still	.93	gallon
After making gas	.71	
Benzine used	.22	
Returned from condensers	.08	
	.14	Benzine used.
		Gas made 8.4 cu. ft.

No. 7.

Benzine used	.49	gallons
Returned from condensers	.22	
	.27	Gas made 21.6 cubic feet.

No. 10.

Benzine used .25. Gas made 14 cubic feet.

The meter used was an ordinary 5 ft. dry, with a dial indicating 5 cubic feet for one revolution of the hand.

PERMANENCY OF THE GAS.

The specific gravity of illuminants would prove to a chemist their permanency, under ordinary circumstances. The following experiment was repeatedly made, however, and should remove all doubts about permanency.

The gas was passed through about 50 feet of ¾ inch lead pipe in a mixture of ice and salt.

Before passing, the gas gave for .72 cubic feet per hour, .231 reading of bar=11.1 candles.

After passing through coil, for .76 cubic feet per hour .224 reading of bar=12.0 candles.

The increase in illuminating power was owing to condensation of small per centage of hydrocarbons, making the flame a trifle more brilliant. This experiment was witnessed by a number of gentlemen, and upon making it, I had explained that possibly an increase of candle power might be observed, because owing to gas being very rich (52 c. f. per gallon) the burner was not adapted to it.

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* Indeed, both in these and the next two experiments with potassa, the purifying material was colored slightly green by the absorption of some other ingredient than carbonic acid. It was found, also, that the lime and potassa soon ceased to act upon the acid, and, on opening the purifier, this loss of action was accounted for by finding the purifying material quite *dry*. Its action could be restored again, for a time, by moistening it. That this inaction does not occur so soon when the crude and sulphurous gas is acted upon in the ordinary dry-lime process, I think, is quite clear, for I have frequently determined the carbonic acid in gas purified by that process, and have found, almost without exception, that when the sulphuretted hydrogen was taken out, I could discover but faint traces of carbonic acid. And it has been equally true that, when sulphuretted hydrogen was present, carbonic acid was also present.—F. E. S.

PHOTOMETRICAL EXPERIMENTS WITH THE GAS.

Reading of bar. (1)	Reading of bar. (2)	Meter per Minute.	Consumed per hour.	Candle Power.	Size of Flame.	Sp. Gr. of Gas.	Illuminants p. ct.	Non-illuminants.	Yield per lb. of N.	Burner.
.199	.235	.019 (5)	1.14	16.2 10.6	Width. 2¾ in. Height. 2¼ in.	1.034	40.05	59.95	13 c. f.	Batwing (A)
.212				13.8						
.190	.213	.0273	1.44	18.2 13.6	Width. 3 in. Height. 2⅜ in.	1.034	...	...	...	Batwing (B)
.198				16.4						
.221	.242	.021	1.26	12.4 9.8	Width. 2⅜ in. Height. 1¾ in.	...	...	...	...	Batwing (C)
.221	...	.025	1.5	12.4	Width. ⅞ in. Height. ¾ in.	...	...	...	...	Gleason Argand.

The first reading of bar is for flat of burner; second for edge. All the burners gave a very clear light, with *no smoke*. This table represents about the best results obtained. Many trials were necessary before a proper burner could be obtained. The specific gravity of this gas was 1.034, of non-illuminants .838; of illuminants absorbable by bromine 1.252.

A two foot Scotch tip, iron, gave better results than above, namely 12.5 candles for ¾ foot gas per hour, but the flame was not as perfect.

CHEMICAL EXCERPTS.

14. *Detecting Artificially Colored Wines.*—Phipson proposes the spectroscope for this purpose. He asserts that naturally colored wines give no definite absorption bands, but only a very general absorption, greatest towards the violet; whereas, Brazil wood and so on, produce very distinct absorption bands. He adds water if the wine is too dark. The least sign of an absorption band he deems suspicious. This method may prove of great value.—*Journal Franklin Institute, June.*

15. *On the Color of the Lake of Geneva and Mediterranean Sea.*—Mr. Tyndall's experiments with bottles of water from the Lake of Geneva and the Mediterranean sea placed in the convergent beam of an electric lamp seem to prove that the deep blue color is due to the effect of minute foreign particles suspended in the water, intercepting and scattering in excess the shorter waves of light. The path of the beam through the liquid was marked by a blue band.

From the blueness of the light transmitted through a column of the water, he concludes that part of the color must be due to a molecular absorption of the less refrangible elements accompanying the blue.

These results accord with those of M. Soret, and with Mr. Tyndall's investigations into the causes of the blueness of the sky. He suggests that the fine particles suspended in the water of Lake Geneva, at least, are probably from glacial streams.—*Am. Jour. of Science, April.*

16. *Coal.*—The following is cited from the report of Prof. Andrews, in the State Geological Report of Ohio for 1869, recently published, p. 108:

"All the authorities on the subject of coal have hitherto supposed the sulphur to be chemically combined with iron in the form of a bisulphide of iron (FeS^2) Prof. Dana, in his recent work on Mineralogy, expresses a doubt in regard to this, in the following paragraph, page 756:

'Sulphur is present in nearly all coals. It is supposed to be usually combined with iron, and when the coal affords a *red ash* on burning, there is reason for believing this true. But Percy mentions a coal from New Zealand which gave a peculiarly white ash, although containing from 2 to 3 p. c. of sulphur, a fact showing that it is present not as a sulphide of iron, but as a constituent of an organic compound. The discovery by Church of a resin containing sulphur (Tasmanite), gives reason for inferring that it may exist in this coal in that state, although its presence as a constituent of other organic compounds is quite possible.'

By an examination of Prof Wormley's table of analyses of the Lost Run Coal, it will be seen that in no case is there iron enough in the coal to take up in combination all the sulphur. In No. 27, the sulphur is 1·01 per cent. Adopting for the combination of the bisulphide of iron the proportion given by chemists, viz: iron 46·7, and sulphur 53·3, in 100 parts, the sulphur in No. 27 would require 0.884 per cent. of iron, whereas Prof. Wormley finds only 0.09 per cent. This 0·09 per cent of sulphur to make the usual iron pyrites, and there are consequently 0·908 per cent of sulphur elsewhere in the coal than in combination with iron.

Another marked illustration of the disproportion of sulphur to the iron in a bituminous coal is found in the analysis of a coal from Washington county. The coal is a white ash coal, and the sample analyzed had been in the cabinet of Marietta college for fourteen years, and showed none of the usual tendency to disintegrate from a change of the bisulphide to the sulphate of iron, a salt which, in crystallizing, breaks the coal by its expansion. The sample was found by Prof. Wormley to contain only 0·390 per cent. of iron, but 3·330 per cent of sulphur. There should have been but 0·455 per cent of sulphur, if the sulphur were limited to a bisulphide of iron."—*Am. Jour. of Science, March.*

The Mississippi Valley and Its Resources,

With a Description of the Works of George Stacey & Co.—Indianopolis Gas Works, Etc.

The capabilities of the Great West for the development of the scientific and manufacturing resources of the country are but little known, and as the Gas Light Journal is devoted to the speciality of gas and its kindred interests, we think it would not be amiss to specify some of the prominent advantages in that particular line, which the great Valley of the Mississippi furnishes for supplying the wants of the millions of people, who in the course of time, will occupy and possess that land.

In doing this, we think that some of our Eastern readers will be astonished at the immense resources, natural and mechanical, which are only in the infancy of their development, and will show to our Western readers that *their* best interests will be subserved, by fostering as far as in their power lies, those industries which if encouraged by them, will eventually tend to the fuller development of the mining and mechanical capacities of that section.

Coal.

Nature has, in a wonderful degree, favored this great valley with large deposits, at various points, of the best quality of bituminous coals for gas purposes, on the continent, and perhaps in the world, when we take into consideration the quantity of the yield, and the value of the residues after carbonization. At the present time the far famed varieties of Youghiogheny coal, which are found near Pittsburg, Pennsylvania, are the best known and most largely worked.

This coal is furnished to our Eastern gas manufacturers by the Penn and Westmoreland Gas Coal Companies; two corporations who ship over the Pennsylvania Central Rail Road millions of bushels per annum. Other millions go from this same region of country to the Lakes, and from thence throughout the whole North West, and still other millions are shipped by the Ohio and Mississippi Rivers and their tributaries, through the West and South West. This coal will yield on an average 4.25-100 cubic feet of gas to the pound of coal, with coke of a superior quality, which finds ready sale at good prices, and with the amount received for coal tar, very materially lessens its cost; so that although very excellent bituminous coal for the manufacture of gas, with a yield of say, 3.85-100 cubic feet per pound, may be found over a large area of the West, the coke is inferior and finds no sale; consequently it is cheaper to purchase the Youghiogheny coal at higher rates, than to use the inferior coals at a greatly reduced price.

The intelligent manufacturer will soon learn, that when he takes into consideration the poorer quality of the gas, the extra cost of purification, largely increased condensation, inferior coke, and additional labor required, he will discover that the highest priced article is the cheapest and best by all odds.

In addition to the vast deposits of the best quality of gas-producing coals, the "Illinois coal field, including a small portion of Indiana and Kentucky contains 55,000 square miles. The Missouri and Iowa coal fields occupy 50,000 square miles. Michigan possesses 12,000 square miles of coal area; Kansas coal fields, including the Indian Territory 20,000 square miles while the great Colorado coal field, which reaches from the Britishpossessions into Mexico, 1,200 miles, is in many places120 miles in width, and contains five remarkable beds of coal, from five to twenty-five feet thick. It is the largest and most valuable deposit of coal in the world."

In Clay and other counties in Indiana immense deposits of block coal are found, which are unequalled for the manufacture of iron; as a consequence, blast furnaces, rolling mills, and machine shops are being built with a rapidity which is almost magical. Capital from the eastern slope of the Alleghanies is pouring into these Western mines; cities, towns, and villages are springing up in every direction, filled with a hardy, intelligent mining and mechanical population, whose wants are supplied from the rich prairie farms which cover, and are interspersed with these vast mines of mineral wealth.

Iron.

Coal and iron are intimately associated in nature; all the great coal fields of this country and Europe have large iron deposits near at hand. In many places coal and iron mining may be seen going at the same instant. While large deposits of iron are found in innumerable places in the West, Pilot Knob and Iron Mountain in Missouri are the most noticeable deposits on a large scale; the aggregate estimated quantities in these reaching the enormous figures of 244,160,148 tons. This is entirely independent of myriads of other deposits "of the purest specular and hematite ores, and in quantities which defy exhaustion." While the magnetic iron ore of the Lake Superior region, with the ores of Indiana, Tennessee, and other points, furnish other inexhaustible deposits for the uses of the world.

Coal and iron are the most material natural products involved in gas manufacture; the one for carbonization, and the other for manufacturing and storing the valuable results of distillation; yet another article of the very best quality the world has yet seen, is found in large quantities in the West, in the shape of

Fire Clay.

These deposits are also numerous and inexhaustible; and as Clay Retorts will soon be the only article used for the carbonization of coal, this branch of the mechanic arts is looming up in importance, while large manufactories of Clay Retorts, Tile, Fire Brick, etc., are even now beginning to rise in magnificent proportions on every side. The East has heretofore had almost the exclusive monopoly of this branch of manufacture, but as from time to time our Western capitalists discover the valuable qualities of our clays, which are being daily developed, and the large market for the sale of this class of manufactures, it will be seen that our Fire Clay Works will be second to none on the continent.

As then the West possesses all the prerequisites in the largest degree for the supply of these staple articles, which are employed in the manipulation of gas, we would now bring before the minds of our readers, one of the many industries by which these staples take form, for the use of the gas manufacturer.

From time to time there has appeared in the Journal, descriptions of the operations of those mechanical establishments who are actively engaged in manufacturing the machinery peculiar to gas works in the East, and we thought it might prove an acceptable treat to your readers, if we would, as opportunity offered, show up the facilities at the present time existing in the West, and of the importance of which but little is known to the gas fraternity at large, only as they may have availed themselves of the scientific and mechanical skill of the parties referred to.

One of the most prominent, and what may be considered a representative firm in the West, engaged in the manufacture of gasholders, iron roofs, water tanks, automatic hydraulic wells, hydraulic mains of cast and wrought iron, dry centre valves, iron retorts, mouthpieces, stand-pipes, lamp-posts, etc., etc., is that of

George Stacey & Co.

This firm is located between Mill and Wood streets, Cincinnati, Ohio, and has been in operation at this point since 1851. As at present constituted the firm consists of George Stacey, the active, energetic and venerable head of the firm; Henry Ranshaw, his able and invaluable assistant, who gives his undivided and exclusive attention to the wrought iron manufacturing department; and William Stacey, who when not engaged at the works, personally supervises the building of the holders, putting on the iron roofs, and in fact the general work to be put up at the various gas man-

ufactories. In this duty he is ably assisted by his brother, Frederick Stacey, who, when occasion requires (which is frequently the case), has to leave the manufactory, and they are both engaged in superintending the erection of holders, etc., at different points.

The foundry is under the able superintendance of Thomas H. Burch, to whose scientific and mechanical skill the fine class of castings sent out by this firm are wholly due. Last year we saw the cast iron case for a large station meter, 10 feet by 8 feet, for the Cincinnati Gas-Light Company, which was cast in this foundry, and would compare favorably with the best we have ever seen from any eastern establishment; so also with their dry centre valves, from 4 inches to 20 inches, lamp posts, etc.

The manufactory has a front on Mill street of 140 feet, and a depth running past Ramsey street to Wood street of 343 feet. The entrance to the office and works is from Ramsey street, which is cut off at this point by the works. The foundry is located on Mill street and is 90 feet square. George Stacey, Esq., the head of the firm, has had forty years experience in the business, twenty years of which time was spent in erecting gasholders, constructing bridges, etc., in London and on the continent. Building wrought iron bridges for railroads, etc., is also a specialty, they having erected a large number on the line of the Indianapolis and Cincinnati, and the Terre Haute and Indianapolis Railroad Company's roads.

During the past year this firm have used over 500 tons of wrought iron in the construction of holders, water tanks etc,, etc., and are the largest consumers of that article in Cincinnati.

To give some idea of the amount of work done by this establishment in the manufacture of gasholders alone, we would state that during the past three years they have built thirty-five gasholders, with an aggregate capacity of 1,782,900 cubic feet, or nearly one gas holder per month of an average capacity of 50,000 cubic feet. This year already, they have under contract eight gasholders.

Indianopolis, Ind.	107,000	cubic	feet.
Kansas City, Mo.	200,000	"	"
Newport, Ken.	120,000	"	"
Chillicothe, O.	35,000	"	"
Ottawa, Ill.	39,000	"	"
Charleston, West Va.	20,000	"	"
Green Bay, Mich.		–	–

A number of these holders are the second and third constructed by them for their various owners, a convincing proof that their mechanical skill and ability were duly appreciated. Specimens of their handicraft may be seen from Frostburg, in Maryland, on the east to Denver City, Colorado, on the west; from Green Bay, Michigan, on the North, to Selma, Alabama, on the South.

One great advantage this firm possesses, is the fact that the works are contiguous to and on the line of the Indiana and Cincinnati, Baltimore and Ohio, and the Ohio and Mississippi Rail Road Companies tracks, so that goods can be shipped to any point in the Mississippi valley, without change of cars.

Before proceeding further, we would take this occasion to express our thanks to Mr. Sutton, the gentlemanly clerk of this firm, for the valuable information so kindly furnished.

[To be Concluded.]

The Buffalo Mutual Gas Light Co.

The *Buffalo Courier* of 7th inst., says, it looks very much as if we were to have some competition in the manufacture of gas.

The Buffalo Mutual Gas Light Co. have recently purchased, as we learn, a large tract of land on Elk street, near the line of the L. S. & M. S. Railroad, on which they propose to erect a large and substantial set of gas works. The contract has been given to reliable parties, and work will be commenced during the coming week. Robert Cartwright, of Cleveland, has been retained by the company as their Engineer, and his reputation alone is a sufficient guarantee of the reliability and character of the works to be erected. The contract calls for a complete set of works (brick and iron) of a capacity of half a million cubic feet per day, besides the laying of thirty miles of mains. It is said that nearly all the stock has been taken by New York and Buffalo parties, and ten per cent. has been called in. As soon as brick and iron can be laid on the field the works will speak for themselves. The officers of the company are:

President—A. Reynolds.
Vice-President—D. Ransom.
Secretary—A. G. Stevens.
Treasurer—T. H. Marvin, of New York.

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—Eds.

Further on the "American Iron Purification Process" of St. John and Cartwright.

21st Street and Ave. A., N. Y. City,
May 15th, 1871.

Messrs Editors: Our method of purification of gas has been fully explained in your columns before. Our reason for writing you now on the subject is, that this method has been now in highly successful use for long periods in a number of gas works throughout the United States, and it appears to us but justice both to ourselves and to manufacturers of gas, that we should be allowed to present about this time some further facts.

Your readers have already (Journal of Jan. 2d. p. 5) the statement of Mr. McGown, President of the Harlem Gas-Light Co., that at least 25 per cent. of labor is saved. To this we now add that our prepared material, as furnished to that company in Feb. 1870, is *still* working very perfectly at this date, and that their tests with ordinary lead paper show that they can now run their purifiers 18 to 20 days, whereas before using our method, they had to change every day, and when at their maximum make, still oftener! We would recall also the facts stated in the letter from the late lamented Mayor Blake, of Worcester, (Journal of Jan. 16, p. 24) who used the same material (from us) for more than one year, and says that he charged a purifier May 11, 1870, and had no occasion to change again until July 29th, making 79 days, an achievement which is so far from being equalled before in the history of gas purification, that it would be almost incredible without his testimony.

This great power and durabililty is due in part to our mode of loosening up our materials with waste iron borings or turnings, instead of saw dust, sand or other useless and inert matter, as in methods now being tested in one or two of our gas works. The use of lime, too, in such mixtures we would submit, involves danger of foul odors, as has always been the result of experience. To those who use lime *alone* for purification, the economies of our method must be apparent, for it is safe to say that lime will not purify *on an average* more than 3000 feet per bushel of gas from the average coals now in use in America, at an average cost of say nine cents, or *three cents per thousand feet for material*, while our composition costs only *one third of a cent per thousand*, making a saving of 2.66 cents per thousand, or on a million feet of $26.60, besides the saving of labor, *at least* 25 per cent., which latter, we may now say, is usually far more than this.

Such results are obtained daily at most all the works (from which we have full advices) where our material are in use, and if there be any exception, it is from causes arising otherwise than from our material.

Gas manufacturers will now please take note, that so satisfactory is our evidence of the actual facts accomplished by our methods, that we are now prepared to enter into agreement with any gas company to the effect that their purification shall be accomplished upon terms and conditions without parallel now or heretofore in any country; that is, that after the requisite amount of our basis material has been provided to supply one sett of purifiers in any works, we can and will guarantee that the cost thereafter (outside of labor) shall not exceed one third of one cent per thousand, or $3.4⁰ per 100,000, $340 per million, or, on a very large scale, say $2000 for six hundred million feet. This to apply to gas made from Province or West Virginia coals, which have in combination about 4½ to 5 per cent. of sulphur.

In conclusion we wish to say that we have printed a small circular, covering every practical detail of information about our process and material, in very concise form, which we shall be pleased to mail to all who will be kind enough to apply.

Very respectfully,
St. John & Cartwright.

Desultory.

Office of the City Gas Works.
Alexandria, Va., May 22d, 1871.

Messrs. Editors: The last time that I wrote you, I stated that I would not let you forget, that although we were somewhat obscure in the gas world, we still exist and are getting along quite prosperously.

I very seldom see any prominent gas men in our city, but earnestly hope in their peregrinations they may be induced to give me a call; and were it not for the Journal, I fear I should be in total darkness as to what is going on in the gas line, outside of Alexandria.

Our consumption is considerably on the increase and as our city is rapidly recovering from the desolating effects of our late unhappy struggle, it will continue to increase.

I read with deep interest, the various discussions going on in the Journal, and in some of them see where I might apply to our works some of the ideas suggested, by giving me greater facilites in conducting the works. We are without an exhauster, which I regard as indispensable to the economical arrangement of works the size of ours. We use both iron and clay retorts, and of course the deposit of fixed carbon in the clay is very much greater than if the pressure was removed by the aid of an exhauster. Indeed I cannot say I am an advocate of clay retorts without an exhauster. The carbonaceous deposit is so great, where rich coal or any rich hydrocarbons are used for the generation of gas, that it makes it necessary to clean them every four or five weeks where proper heats are kept up, and then it takes so long to get them in good working order again, owing to their porous condition when the carbon is removed.

We are also without a governor, which I regard as highly important in the distribution of gas, as the regulation of the flow is so desirable to satisfactory combustion.

We use the very best coal for the manufacture of our gas, and I know from the eye that our gas is good, but not having a photometer, I am unable to determine the exact candle power, but feel very sure it will average 16 candles.

I see very little in the Journal about meters. I would be very much pleased to hear the opinions of some of your able and intelligent correspondents, as to the merits of the various kinds of meters, as I think some very necessary improvements might be suggested. There has been some complaint in regard to our running the water from the washers into the river, in consequence of its containing a small quantity of ammoniacal liquor. It is alleged that the fish with which the Potomac abounds is injured thereby; but I do not think that such is the case, for a very small portion of ammonia passes off in this way, and what does, floats on the surface of the water; moreover matter of all kinds find their way into this river, and what else could we do with it, unless we could make it pay by carrying it through a chemical process, making it fit for coloring purposes, or as a fertilizer.

We have had a very destructive fire in our city. Our market house in the upper part of which was located all the public offices, including the gas office, was entirely consumed; our books fortunately were all saved.

I am, yours truly,
Jacob Roxbury, Sup't.

Something New—Exportation of Gas.

Niagara Falls, May 29, 1871.

Messrs. Editors: It is said "there is nothing new under the Heavens," and while this may be true as a rule, yet if it be also true that "there are exceptions to all rules," it may be possible that I can succeed in establishing the truth of the heading of this article.

On the 27th of May, at precisely 7 o'clock, P. M., a new article of commerce was introduced among the nations of the earth, in the form of carburetted hydrogen gas for illuminating purposes, in a foreign country; and although this emergency was never contemplated by the law-makers of any country, yet this anomaly is provided for by all commercial countries in their revenue laws, by a sweeping clause of "10 per cent. on all unenumerated articles," which must necessarily include all articles of commerce existing or to exist, not otherwise provided for.

The Clifton House, at Niagara Falls, is situated on the western bank of the Niagara River, in the dominion of Canada, near to and in plain view of the Falls, and about 300 feet from the new wire Suspension Bridge that spans the Niagara River, near the American Falls, a distance of about 1,300. This Hotel is a favorite with the public. The present lessees, Messrs. Fulton & Colburn, have fitted it up this spring at a great expense; and as the artificial light heretofore used at this house, made from hydrocarbon fluids, was not satisfactory, they made application to our gas company for a supply of gas from our works, which are situated about 200 yards from the American end of the bridge.

The proposition of the proprietors was accepted by our company to furnish this hotel with gas, to be measured through a meter on the American side, and about 300 feet distant from the eastern tower of the bridge. The hotel proprietors, to obtain the right of way across the bridge, and to make all necessary arrangements with the Dominion Government for *the payment of duties on the gas that passed into their country, that their laws might impose.* The bridge company with great liberality gave the right of way,

by provision being made in laying the pipe across the bridge, for five burners upon the bridge, the bridge company to pay for all the gas they might consume.

In three days the pipes from our mains near the gas works, were laid to and across the bridge, and connected with the piping of the Clifton House. While the last connection was being made a permit was received from the government officials, allowing the gas to be passed into the territory of the Dominion of Canada from the United States, pending negotiations with the Dominion Government at Ottawa, in regard to the mode of measurement and the manner of payment of duties; and in five minutes after the arrival of the permit, the flow of gas passed from one nationality to another.

It is possible that in consequence of the duties having been recently taken off of bituminous coals, and the gas being the product of this coal, they may consent to remit this accidental tax; if not, the duty of 10 per cent. must be paid as an article not enumerated in the schedule of duties. This is undoubtedly the first time in the history of the world, that illuminating gas has been imported from one nationality to another; the duty fixed being accidental, as such an emergency was never contemplated in commercial intercourse.

The gas is taken from the street mains about 75 feet, to a small building containing two 60-light meters; thence through three inch cast iron mains, some 300 feet to the east tower; thence down and under the bridge to a drip: thence through a two-inch wrought iron pipe to a point where the camber of the bridge flooring would bring the drip towards the tower; thence up through the flooring of the bridge and along the top of the same, laid upon blocks an inch thick every six feet—about 239 feet, at which point it is connected with an "expansion joint," capable of being extended twelve inches; from thence 239 feet to the centre of the bridge—the national boundary, at which point is attached another "expansion joint"; from this point the pipe is reduced to 1¼ inch, and at a point equi-distant from the centre of the bridge to the Canada Tower is attached a third "expansion joint." The whole length of pipe on the floor of the bridge is 1,276 feet, and unfastened except at the two ends, where it passes through the floor of the bridge.

The Clifton House is now beautifully lighted with 18-candle gas, imported from the United States, on which the proprietors must pay the government duty, *or be liable to seizure.*

Now, Messrs. Editors, there is nothing surprising in the foregoing, except the novelty of this transaction, which is subjected to all the formalities of commercial intercourse between nations. I started to show that there was something new under the Heavens. Have I succeeded? Yours truly,

T. G. HULETT,
Eng'r and Sup't Niagara Falls Gas Co.

The Stevens Institute at Hoboken.

[The following very complete account of this new Institution we take from the Philadelphia *Press*. Our readers will recognize full well the name of the distinguished President, Professor MORTON, whom we are happy to claim among our contributors. The undertaking of this trust by this gentleman adds one more to the (none too dense) ranks of the real cultivators of science in our city, while it deprives our sister city Philadelphia, of one. Her loss is our great gain. —H. W.]

It has not escaped the notice of those who are interested in the progress of education that the methods of teaching have undergone a very complete revolution during the course of the past ten years. All the changes which have been made have aimed at rendering students better prepared for the practical duties and business of life. There has been a growing want, deeply felt throughout the community, for men specially educated to do certain kinds of work, and trained under the eyes of skilful teachers to familiarity with the best methods and processes in the mechanic arts.

The latest institution growing out of this want, and which is perhaps the best designed to satisfy it, is that which has been founded at Hoboken, in New Jersey, through the munificent bequest of the late Mr. Edwin A. Stevens. In honor of its founder it has been called the Stevens Institute of Technology. This distinguished engineer bequeathed to an institution for the increase and diffusion of knowledge, and which he ordered to be erected at Hoboken, a large plot of ground located in the upper and more beautiful part of the city, the sum of one hundred and fifty thousand dollars for the erection of the necessary buildings, and an endowment fund of half a million dollars, together with such other resources as would make the yearly income, irrespective of fees from students, about forty thousand dollars. While the students were not to have their education entirely free of cost, only moderate fees were to be exacted from them. This was done from the belief that an education for which something was demanded would be the more valuable and the more highly appreciated, while few students would be wealthy enough to defray all the expense of such an elaborate and costly education as will be given them in this institution.

When Messrs. Wm. W. Shippen and S. B. Dod, of Hoboken, the trustees, and Professor Morton, who had been appointed president, came to deliberate upon the best mode of carrying into effect the designs of Mr. Stevens, they decided that an institution in which mechanical engineering should be made the central idea and the other most important applied sciences should be grouped about it would realize them most perfectly.

[In our next this article will be concluded, with a complete description of the plans and organization of the new Institute.]

The Use of Torpedoes in Oil Wells.

The ROBERTS patent for increasing the productiveness of oil wells, by the use of torpedoes has just been sustained in the United States Circuit Court, sitting at Pittsburgh, Pa. The patent consists in sinking to the bottom of the well, or to that portion of it which passes through the oil-bearing rocks, a water-tight flask, containing gunpowder or other powerful explosive material, the flask being a little less in diameter than the diameter of the bore, to enable it to slide down easily. This torpedo, or flask, is so constructed that its contents may be ignited either by means of caps with a weight falling upon them, or by fulminating powder placed so that it can be exploded by a movable wire, or by electricity, or by any of the known means used for exploding shells, torpedoes, or cartridges under water. When the flask has been sunk to the desired position, the well is filled with water, if not already filled, thus making a water tamping, and confining the effect of the explosion to the rock in the immediate vicinity of the flask, and leaving other parts of the rock surrounding the well not materially affected.

When these arrangements have been completed, the contents of the flask are exploded by the means above mentioned, and, as the evidence showed, with the result in most instances of increasing the flow of oil very largely. The theory of the inventor is that petroleum, or oil taken from oil wells is, before it is removed, contained in seams or crevices usually in the second or third strata of sandstone, or other rock abounding in the oil regions. These seams or crevices being of different dimensions, and irregularly located, a well sunk through the oil-bearing rock may not touch any of them, and thus may obtain no oil, though it may pass very near the crevices; or it may, in its passage downward, touch only small seams, or make small apertures into neighboring crevices containing oil, in either of which cases the seams or the apertures are liable to become clogged by substances in the well or in the oil. The torpedo breaks through these obstructions and permits the oil to reach the well.

Judge STRONG, in delivering the opinion of the Court, holds that while the general idea of using torpedoes for the purpose specified is not patentable, the particular method of employing them, invented by Mr. ROBERTS is patentable, and therefore that he is entitled to protection.

Subterranean Gas Lighting.

There is nothing more rude than the lighting of mines by candles stuck with a dab of clay to the caps of the workmen, or placed between two slender blades making a fork at the end of a stick. To supersede such clumsy modes of illumination nothing seems more feasible than to force gas through pipes, and substitute the broad blaze of a burner for the flickering flame of the greasy wick. No success seems to have attended the several methods hitherto proposed of doing this; but new plans are being suggested from time to time which may give greater promise, and therefore be sooner adopted than those now known.

One of the latest projects includes a new application of steam, and has at least the merit of simplicity. An induced current secured by a steam-jet carries the gas into a pipe, by which it is conducted to the subterranean locality where the light is needed. A receiving-vessel is provided in such locality, and with this vessel the lower end of the pipe connects, entering through the top thereof. The temperature of the vessel is sufficiently low to condense the steam, which is carried off by a siphon pipe, while a pipe extending from the upper part of the receiver connects with the burner. That any method of lighting mines by gas will be adopted, at least for a long time to come, is doubtful, but that it would add much to the facility with which mining operations can be carried on is more than likely. —*Am. Artisan.*

Firing of Steam Boilers.

Of the firing under steam boilers, much has been said and written in works upon steam engineering, and plain, practical directions for the proper performance of this work have, in various forms and connections, been given in this journal. This is one of the things, however, upon which a paper like the SCIENTIFIC AMERICAN, which aims to instruct all classes of mechanics and workmen, must perforce repeat its precepts. Every year brings forth a new crop of boiler tenders who have to be instructed in regard to their duties from some source. Many of them are ignorant as horses, of the laws of combustion, or the laws of steam; and bad firing must be said to be the rule rather than good firing, so far as this country is concerned. Judging also from complaints on this score in English journals, that nation of steam users is not much better off than ourselves. We shall endeavor to make our remarks on this subject as practical as possible, only referring to theory when necessary to give point to practical directions.

Passing by the kindling of the fire, which requires no particular skill, the regulation of the thickness of the stratum of fuel on the grate, and the supply of fuel to the furnace, next claims attention. The additions of fuel should be made to that portion which lies at the front of the grate, especially when draft holes, at back of the grate, are not used. The fuel thus placed on the front of the grate becomes coked, as it were, before being spread over the grate. In the coking process, the products, first driven off from the coal by the effects of heat, which would otherwise pass out of the chimney as waste fuel, commonly called smoke, will get a supply of air from the apertures in the furnace door sufficient to nearly, or quite, consume them.

When the fuel is of such a character that coking cannot be done in the manner described, it should be spread evenly all over the grate and maintained at as uniform a thickness as possible. We are believers in pretty thick firing, and would hardly recommend a thickness of less than eight inches in moderately large grates, unless under exceptional circumstances; and in no case should fuel be carried more than a foot in thickness in the furnace of any land boiler.

The next thing is the adjustment of the dampers to supply the proper amount of air to the fuel, and here is where most inexpert boiler tenders fail lamentably. Every pound of air allowed to enter the furnace, more than is practically found necessary to consume the fuel at the required rate of consumption, carries off with it heat, which should be applied to making steam. But while boiler tenders are to blame in this matter, it must be confessed that the construction of some furnaces is such as to render the proper regulation of air admission a thing of much difficulty. Grates are often too long in proportion to their width, and in this case, when air is admitted only at the front, more air than would be necessary on a short grate is required in order to keep the combustion perfect at the rear of the furnace. The loss of heat from the improper regulation of the draft is often enormous. The dampers in front should be kept as nearly closed as possible, consistently with the maintenance of a clear uniform bright fire on all parts of the grate.

Another great fault in firing arises frequently in the use of a boiler too small to generate the steam required with economy. The boiler tender finds that he cannot keep the steam up to the required pressure without forcing the firing beyond the point of highest economy, and we may also add, the limit of safety, for there is no doubt that the forcing of boilers beyond their capacity is a fruitful cause of explosions. When firing is forced, the gases of combustion pass with excessive rapidity through the uptake, and do not so nearly impart their full measure of heat to the surfaces over which they pass. This can be easily proved by examining their temperature with a thermometer inserted in the uptake. It will be found that the more the firing is forced beyond a certain point, the greater will be the volume, and the higher will be the temperature, of the gaseous products escaping in a given time.

Loss of heat is sustained in slicing the fire, etc., and this loss is lessened in proportion to the rapidity with which the operation is performed. It is of the utmost importance that the flow of air through the grate should be free as possible, and, therefore, the slicing should be done thoroughly, but as quickly as practicable. This is a point, however, which is more generally complied with than the more important ones above insisted upon.

A difference of twenty-five per cent. in economy between good and bad firing might undoubtedly be often discovered; and, we believe, that with the greater proportion of large-sized boilers used in this country, the wages of skilful firemen might be doubled or trebled with profit, rather than substitute for such men those who are either ignorant of their duties or unfaithful. —*Scientific American.*

Gas-Consuming Boiler Furnaces.

The essentials of a good boiler furnace are few in number, but dependent upon conditions so intricate that their absolute realization in practice is impossible, and their approximate realization a matter of extreme difficulty. To supply the quantity of air requisite to secure the perfect combustion of the fuel, without a surplus of oxygen to aid the inert nitrogen in carrying away heat through the smoke-stack—this is the problem which many have attempted, some with more, some with less apparent success. Without mentioning the large number of modifications of the plan of supplying air in thin streams or jets to the flame which was so loudly and thoroughly advocated by C. Wye Williams long ago, we propose to make brief mention of a new application of a similar principle, by which some of the more obvious defects of the plan of admitting the air at the rear of the furnace seem to be overcome, and which on a locomotive on the South Side Railroad of Long Island, is claimed to have given the same quota of work with two tuns of soft coal that, with a locomotive of the ordinary type, has hitherto required two tuns of the same fuel.

The construction of the furnace itself is simple. The fire-box is of the usual form and construction, but behind it the tubes are shortened about half their length, to make room for a combustion chamber divided from the fire-box by a transverse partition, but communicating therewith by a large opening above the partition. The air, admitted through a wire-gauze inlet in the furnace-door, mingles in minute streams with the gases rising from the fire-box, and, being simultaneously heated by and intermingled with the gases, is carried with them to the combustion chamber, where space and time for perfect combustion, which of course prevents smoke and the escape of unconsumed gases, takes place. The water-legs of the boiler have within them vertical partitions, so arranged that the water rising next the heating surface, that on the opposite side of the partitions flows downward, thereby insuring a circulation of the water in a manner easily understood. For stationary purposes, equal results are claimed; a boiler in the Chicago and Northwestern Railroad machine shop, on the new plan, consumed 2,700 pounds of coal in the performance of work for which the boiler previously in use required four thousand pounds. Should these results be verified by more extended practice, the new boilers made by the Western Boiler Company of New York City will afford a striking example of the extent to which a scientific principle is dependent for success in practice upon the special manner in which it is applied.—*Am. Artisan.*

TO INVENTORS AND PATENTEES.

This Journal, circulating, as it does, throughout the United States, Canadas, and portions of Europe, is a superior medium for advertising.

We also take out Patents in the United States and Europe, obtain Extensions, and make a *Specialty* of difficult and abandoned cases.

A. M. CALLENDER & CO.,
No. 42 Pine street, New York.

RECENT AMERICAN PATENTS.

Pertaining to the Specialties of this Journal, for the two weeks ending June 10th, 1871.

115,014.—Vapor Burner.—W. E. Bartlett, Newburg, N. Y.
115,028.—Gas.—J. H. Connely, J. McLure, Wheeling, West Virginia.
115,088.—Vapor Burner.—A. F. Noble, Indianopolis, Ind.
115,154.—Lighting Apparatus.—A. P. Berlioz, Paris, France.
115,182.—Carbureting.—Geo. Edmonds, New Orleans, La.
115,189.—Burner.—T. S. Gates and A. H. Fritchey, Columbus, Ohio.
115,193.—Gas Burning Furnace.—J. Green, Phila., Pa.
115,250.—Vapor Burner.—G. T. Parry, Philadelphia, Pa.
115,269.—Carbureting.—Byron Sloper, St. Louis, Mo.
115,273.—Igniting Gas.—W. H. Smith, New York city.
115,289.—Water Wheel.—W. J. Thompson, Springfield, Mo.
115,298.—Vapor Burner.—T. Ward, Columbus, O., and H. C. Hunt, Chicago, Ill.
115,447.—Gas Joint.—C. Deavs, New York city.
115,506.—Gas Burner.—H. B. Meyer, Phila., Pa.

A RARE CHANCE FOR GAS MEN.

FOR SALE.—A COAL GAS WORKS, SITUATE IN A growing and thriving Southern city, now being rapidly developed by railroads. There is a good brick building sufficiently large for Retort Room, Purifying Room, Office and Meter Room. Present consumption from 90,000 to 120,000 feet per month. In the hands of an expert it can be made to yield a handsome income. Can be had on easy terms.

Further particulars can be had by addressing the Editor o this Journal. 241-tf

NORTHWESTERN
GAS AND WATER PIPE COMPANY.

WORKS AT BAY CITY, MICHIGAN.

CHICAGO OFFICE, 41 REYNOLDS BLOCK.

SECTION OF GAS PIPE.

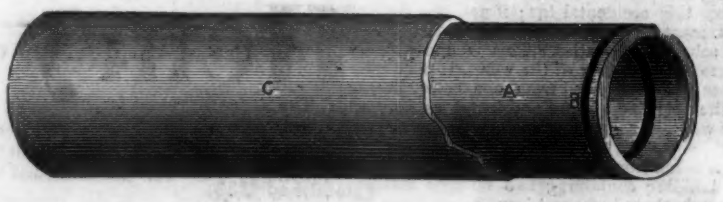


FIG. 2.

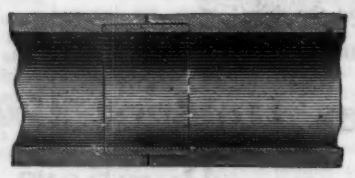


FIG. 3.

A—Cylinder of Wood. B—Band of Iron. C—Coating of Hydraulic or Asphaltum Cement.

FIG. 2.—Thimble for Connection. FIG. 3—Horizontal Section and Connection.

Above is a cut of the

"WYCKOFF PATENT IMPERISHABLE GAS PIPE,"

manufactured by the NORTHWESTERN GAS AND WATER PIPE COMPANY.

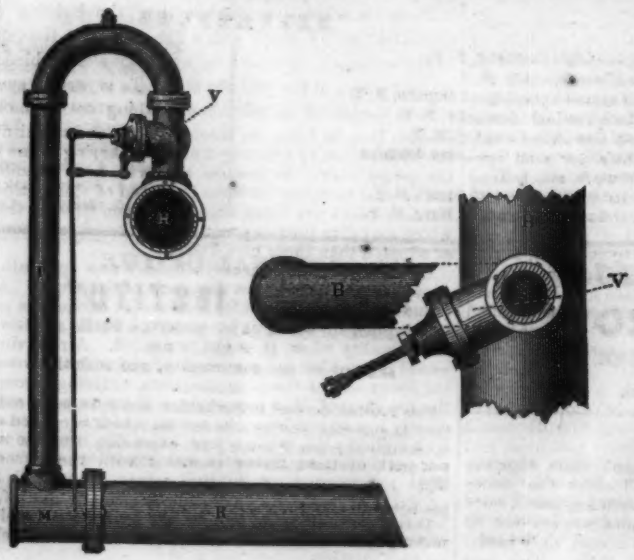
This Pipe is made of White Pine, one inch to twelve inches bore, in sections eight feet long, rounded in a lathe, coated inside and out with Asphaltum, connected with a tenor, or socket, and a thimble joint, perfectly air and water tight, being driven together with cement furnished by the Company. When laid its cost is about one half that of Iron Pipe, and is UNQUESTIONABLY the best Gas conducting Main in use.

☞ Send for Descriptive Pamphlet and Price List. 242-1y

The American Coal Gas-Light Improvement Co.

ARE THE SOLE OWNERS OF THE

GIBSON IMPROVEMENT



In the manufacture of Coal Gas by means of which Dip-Pipes are dispensed with, the deposit of Carbon in the Retorts prevented, and a very large saving is effected.

Licenses for its use will be granted; also the parts necessary will be supplied to order, on application at their office,

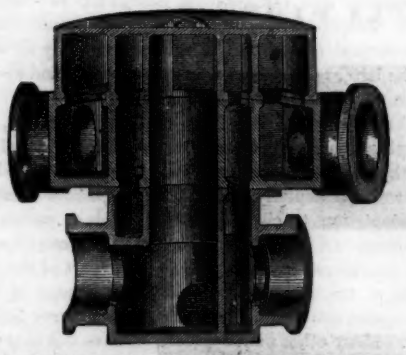
No. 79 Water street, Boston, or
No. 41 Pine street, Room 1, New York.

R Retort.
M Mouth-piece.
P Stand-pipe.
B Bridge-pipe.
H Hydraulic main.
V Valve-substitute for Dip-pipe.

SOUTHWARK FOUNDRY,

WASHINGTON AVENUE,

PHILADELPHIA.



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Henry G. Morris,

Established 1836.

SUCCESSOR TO

MERRICK & SONS.

Gas Holders, Bench Castings, Condensers, Washers, Scrubbers, Purifiers, Dry Centre Valves, Exhausters, Purifier Trays of Wood or Iron, Iron Roof Frames, and Gas Machinery of all kinds of the most approved character.

WILLIAM FARMER,

ARCHITECT AND GENERAL GAS ENGINEER,

111 BROADWAY, TRINITY BUILDING, Room 91, New York.

WILLIAM FARMER may be consulted upon all matters connected with the construction of GAS WORKS and other buildings. Will furnish General and Detail Drawings, Specifications and Estimates for Gas Works of any capacity, Retort Settings, Condensers, Washers, Exhausters, Purifiers, Holders, Coal Hoisting Apparatus, Iron Roofs, and every description of Machinery required in the Manufacturing of Gas.

PATENTEE OF THE FOLLOWING INVENTIONS:

Exhausters for Gas and Foul Lime Ventilation,
Dumping Barrows for Coal, Coke and Lime,
Blowers for Forgers,
Pumps for Water, &c., &c.

REFERENCES:

CHAS. ROOME, President Manhattan Gas-Light Company, N. Y.
SAMUEL DOWN, President American Meter Company, N. Y.
C. VANDERVOORT SMITH, Engineer Manhattan Gas-Light Company, N. Y.
CHARLES MOWTON, Engineer New York Gas-Light Company, N. Y.
SAMUEL P. PARHAM, Engineer Mutual Gas-Light Company, N. Y.
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[NOTE BY PROFESSOR WURTZ.—Contributions and items for which I am, as a Scientist, individually responsible, will have attached my full name or initials.—H. W.]

FRIDAY, JUNE 16, 1871.

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General Editorials.

THE NEW DRY SCRUBBER OF ST. JOHN AND ROCKWELL.

In considering this very novel apparatus, let us say in the first place, that we agree, in a measure, with our experienced Milwaukee correspondent "Out West" (see last issue, page 165), who objects to the name "condenser," while admitting the high adaptation of the apparatus for the operation to which the term "scrubbing" is more strictly applicable, namely the removal of tar and suspended matter from the gas. In fact, it is clear from the specification of the inventors that this latter function is the one they had princi pally in view. The theory of the apparatus is founded on principles which may be put into a very few words, thus: Tar, which is retained by gas after passing the hydraulic seal, is mostly not in a state of solution or homogeneous admixture with the gas, but chiefly *mechanically suspended*, after the fashion of smoke, spray, or fog. In order to demonstrate the existence of this fog to the eye, it is only necessary in fact to collect a sample of gas in this condition, in a glass receiver. Some process of *filtration* would seem most appropriate for the removal of such impurities, and it is indeed thence that the trouble chiefly arises, for it is in the purifying process, which must needs be a species of filtration, that this tar appears, and does the mischief. Filtration, however, applied specially for the removal of the tar, before purification, is obviously impracticable, as any filtering medium would augment the resistance to a pernicious degree and would soon become clogged. The practical study of these difficulties has therefore led ST. JOHN and ROCKWELL to apply what they designate quite properly as the agency of *friction*, over very extended surfaces, to remove these spray-like matters by the force of adhesion to surfaces already enfilmed with the same. All this is so obvious, now that it is at last an accomplished fact, that it is clearly only another case of Columbus and the egg.

While on this subject, however, we must take the occasion to point out another principle, which chemists will concede to be applicable largely to the phenomena of evolution of illuminating gas, when once their attention is directed thereto; and which forms an important element in our own views of these phenomena. We refer to the principle of *supersaturation*, which we are sure has as wide an application to gases as to liquid solutions, though very little study has as yet been given to the former. For example, it is clear that the eccentricities and anomalies presented by *naphthaline* and its congeneric associates, which have always constituted so great a puzzle to the fraternity, are but phenomena of supersaturation of the gas, with a vapor at a temperature below its condensing point, constituting an unstable solution, which is ready to let go the naphthaline on contact with surfaces for which it has an adhesive tendency, just as a supersaturated solution of Glauber's salt instantly crystallizes around a particle of the same salt introduced as a "nucleus." It was doubtless the same train of thought that has led ST. JOHN and ROCKWELL to their invention, that induced the Reverend Dr. BOWDITCH (after endeavoring in vain to condense the naphthaline and other hydrocarbons from gas by snow and salt) to try passing through a multitude of diaphragms of *wire gauze*. We have ourselves repeated Dr. BOWDITCH's experiment and obtained an appreciable quantity of naphthaline from gas from Westmoreland coal, which had resisted a most intense cold without yielding anything appreciable.

Hence we see that in one sense the new apparatus must operate virtually as a condenser, as well as a scrubber; for any *naphthaline*, *xylole*, *cumole*, *cymole*, *spirole*, etc., remaining in the gas, in the form of supersaturated solutions (almost sure to be afterwards strained out by the purifying material, assuming a tarry form, and causing no end of trouble), will be thoroughly "condensed," if we choose to call it so, by the extended enfilmed surfaces of ST. JOHN and ROCKWELL, which present an indefinite number of *nuclei* for attachment, in a manner similar to Dr. BOWDITCH's wire-gauze.

There are other advantages claimed by the inventors for their new *modus operandi*, to which they have, in our belief, attached none too much importance. Chief among these are the avoidance of unnecessary contact with water and the delivery of the gas with as little reduction of temperature as possible. While admitting the desirability and even maintaining the necessity, of removing those hydrocarbons which are held in the unstable condition above pointed out, it is obvious that the usual modes of condensation, such as washing and refrigeration, cannot fail to remove *other* illuminating hydrocarbons which would other wise remain in solution in the gas (certainly so long as the latter is *in motion* or in a large body), and would inure to the benefit of the consumer.

The mechanical ingenuity of these inventors, in carrying their principles into practice, is certainly worthy of much commendation. The adjustable lattice-work particularly, which gives the utmost facility of adaptation to circumstances so liable to variation, will commend itself at once, to the intelligent expert. The provisions for easy access to every part of the interior of the apparatus, and for replacement of the corrugated diaphragms, and so on, also deserve laudation. Many other minor points we have not room to refer to on this occasion, but doubtless we have not yet done with this subject, and these will keep till another day. We hope that we shall be favored with further views from our numerous skilled contributors, on this important topic.—H. W.

VISIT TO THE "CITIZENS" WORKS AT NEWARK.

In the last issue it was stated that we had had the pleasure of making this visit, and shall now proceed to arrange a few of our more important observations on the occasion.

(Our first attention was attracted in the office, by a new and surprisingly improved mode of keeping the records of the manufacture, devised by EDWARD KENNEDY, ESQ., of which, as a subject of general interest to all gas managers, we propose giving an account, at another day.)

We first visited the photometric room and observed with much pleasure the enlightened care which has been bestowed on this department, too frequently regarded, even in the largest works, with indifference. The room itself is more capacious and more conveniently arranged than any we have met with elsewhere. It is proposed to make parallel series of observations with the Bunsen bar and with Lowe's jet (as improved by SUGG and KIRKHAM; see this Journal, November 2, 1870, page 132).

Next the Purifying House, where we found many things of interest. Its dimensions, over all, are 200×32, the Purifying Room itself occupying 120×35, the remaining space serving for storage. The roof is slate, supported by light iron truss-work of elegant appearance. The four boxes, 20×20, present an especially handsome aspect, in consequence of a peculiarity of construction, consisting in an upwardly *convex* form of the covers, with the stays curved to correspond. This must add much, especially in the case of large sized boxes, to the strength and stability as well as to the beauty of the apparatus. We were struck here also with another improvement, which has been adopted from the Providence Works, namely a simplified carriage, much less cumbrous than the ordinary form, for raising and removing laterally the lids of the boxes. With this two men do the whole work in the space of twenty-five minutes. Mr. KENNEDY has adopted as material for purification the LAMING mass, prepared by mixing slacked

lime, copperas and sawdust. This is thrown into the boxes, in bulk, to the depth of two feet, on a diaphragm of boards, with 5-8ths inch perforations, with a six-inch space beneath; each box holding about 640 bushels as a charge. The maximum endurance of such a charge is stated to be 2,200,000 feet of gas before fouling, the coals used being two-thirds Penn and one-third Despard. This is about at the rate of 3,440 feet per bushel. The cost is estimated by Mr. K. to be about half that of lime, allowing three years for the endurance or life of the mass before becoming too highly charged with sulphur.

The most remarkable thing, however, about the purification pructised here, is a mode devised by Mr. KENNEDY, of revivifying the effete mass *in the boxes emselves*, which was represented to me as perfectly successful. This consists in turning over the mass with shovels at intervals (just as in all iron purification) without removal, sprinkling at the same time with *boiling water*. Four days time is required, and an important diminution of labor is thus attained. We were not fortunate enough to see this process in progress, but shall endeavor to do so at another time, and give our readers further information about this highly important matter.

There are other points about this Purifying House worthy of note; for example, in consequence of the fortunate location of these works, on a side hill, sloping abruptly down to the water side, the basement of the house, with all its contained apparatus, has been so constructed as to be above-ground, thus being unusually easy of access and ventilation.

Our next visit was to the Exhauster Room, the neatness and compactness of arrangement of which deserve all praise. An upright engine, from the New York Safety Steam-Power Company, operates a Mackenzie Exhauster furnished with a Compensator, which latter involves some improvements in details of construction, due to Mr. KENNEDY.

Next. the Retort House, where we found 20 benches of KENNEDY'S settings of sixes. The most important advantage of this setting is that all the blocks, tiles, and special bricks are manufactured especially for this setting. There is no cutting of bricks, etc., but in every case the native fire-surface (so to speak) comes into play, and the whole bench is as solid and compact as one brick. Any practical man will see at a glance the virtue of this. We must not fail however to allude to the beauty and symmetry of appearance of this setting, which strike every one at a glance. The performance of these retorts has been found to be remarkable, not less than 7,333 feet each per 24 hours with four hour charges. The Retort House is much more roomy than usal, being 65 feet in width, or 10 feet wider than is customary, and the arrangements in the roof for ventilation comprise some points of novel device on the part of Mr. KENNEDY (which accomplish this important object in a way complete beyond precedent).

There is storage on the wharf. in a building for the purpose, for 5000 tons of coal, with nine feet of water alongside. One holder already in use is telescopic, 40×95, with capacity of 300,000 feet, while there is room alongside for another of the same capacity. A reasonable calculation, making every allowance, shows these works to be adequate to a daily make of at least 800,000 feet. with storage for 600,000; and all this is compacted together on a plot of ground of but 200×350 feet. Nevertheless there is *no lack of room* anywhere. Some may think this incredible, and as seeing is believing, we advise such to go and see for themselves, assuring them that they will be treated with every courtesy by the gentlemanly superintendent Mr. NATHAN W. TREADWELL, and his assistant Mr. EDWARD KENNEDY.

These works were started in December last, and the maximum make, in January, was 210,000 feet daily. At our visit it was about 100,000, with 1,700 consumers, but a great and rapid increase of consumers is shortly to occur, as the company has lately consolidated with the Orange Company, and they are also to supply Woodside, the northern suburb of Newark. These communities, together with Newark itself, are growing so fast, that we look assuredly to see these works, in a very few years, taxed heavily, if not to their utmost capacity, to supply this immense district.

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We shall make our next excursion to the establishment of HOY, KENNEDY & Co. in Brooklyn, in order to view the machinery and appliances by which this fine work is turned out; and trust in the next issue to present our readers with an account of this visit.—H. W.

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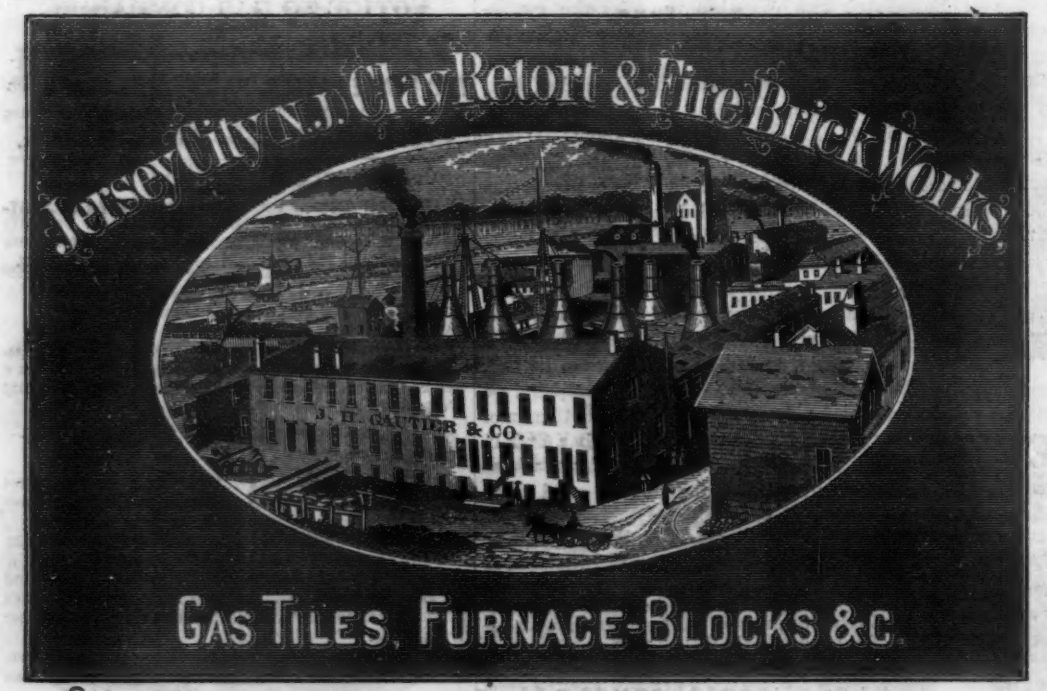

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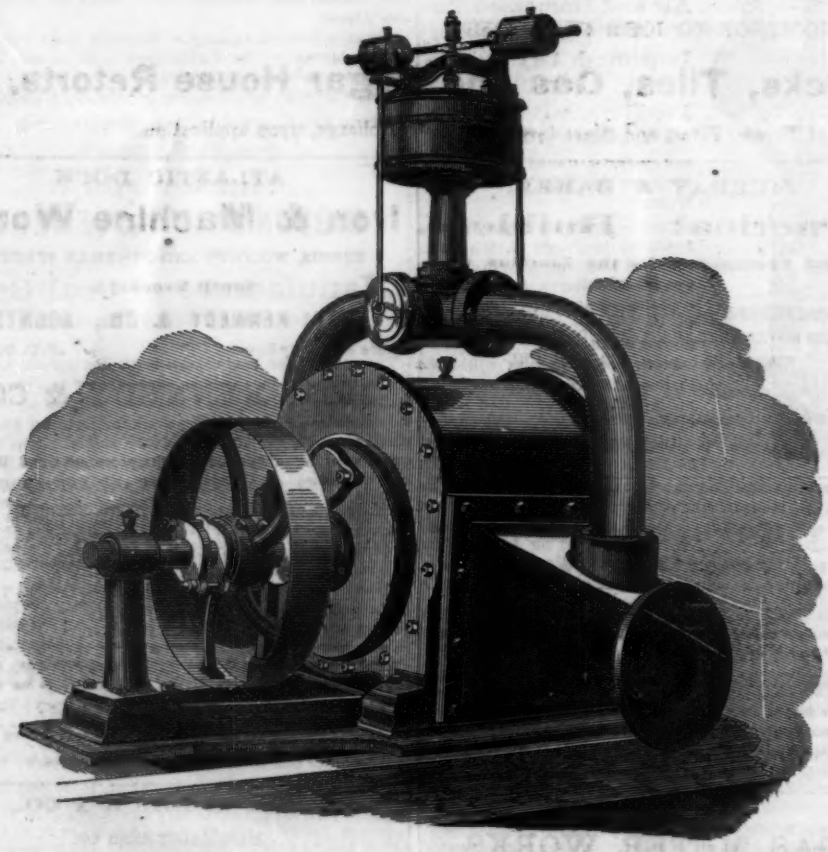

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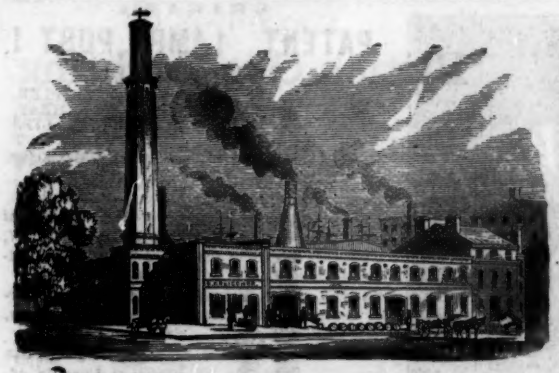

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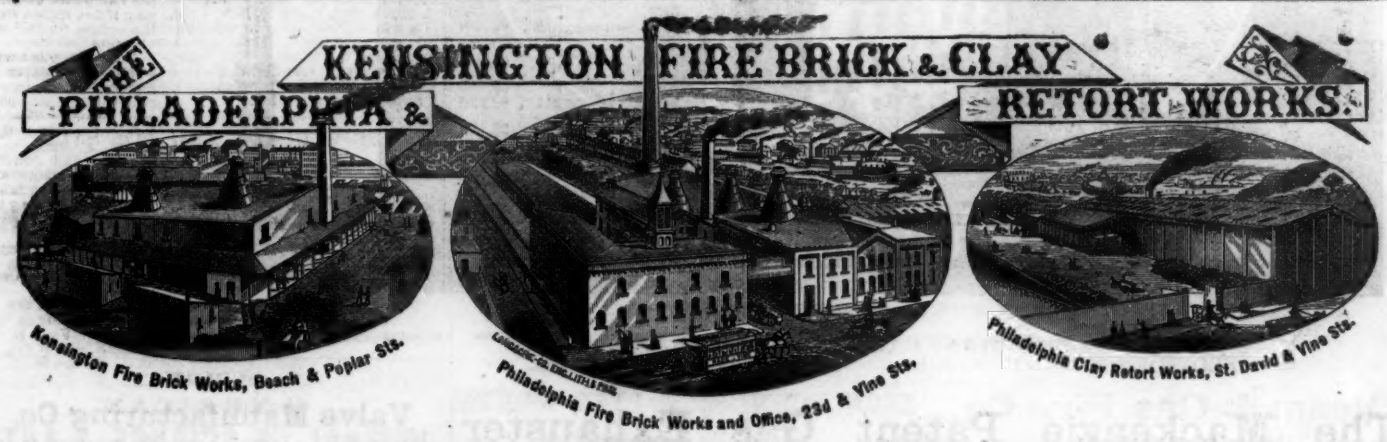
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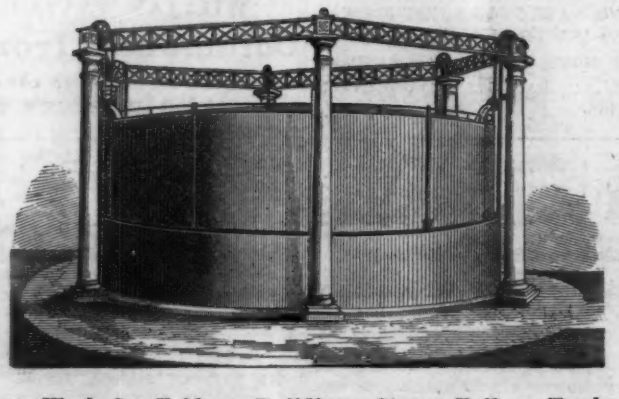

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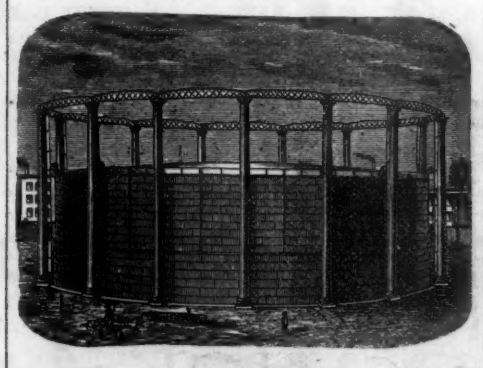

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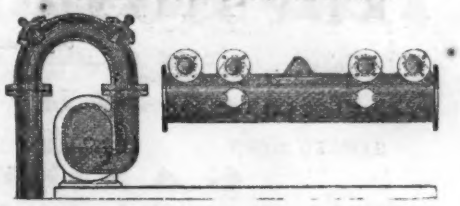

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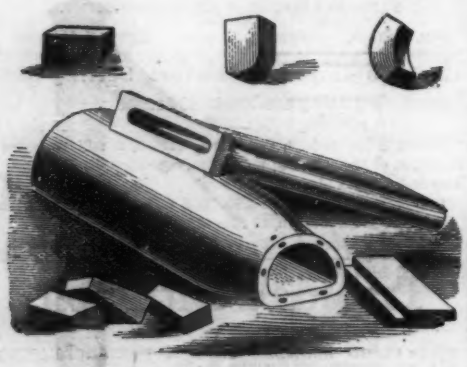

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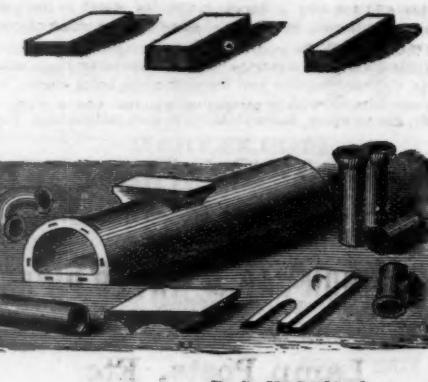

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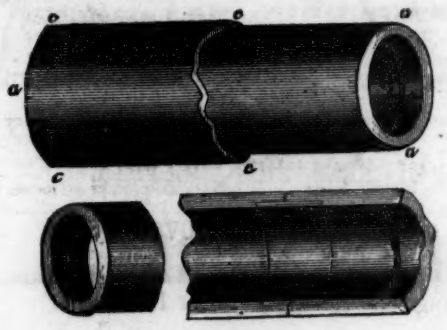

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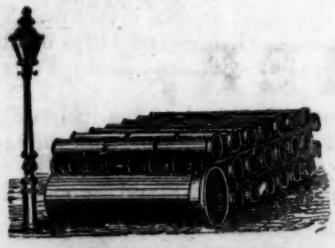

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Estimates furnished for cost of Works, and the cost of manufacturing Gas in various localities.

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PIG IRON & CAST IRON GAS & WATER PIPES.

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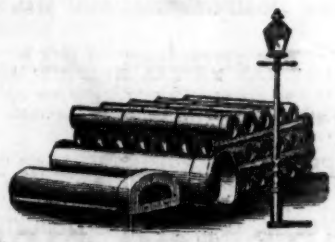

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2 inch Pipes in 8 feet lengths. 3 inch to 60 inch cast in 12 feet lengths.

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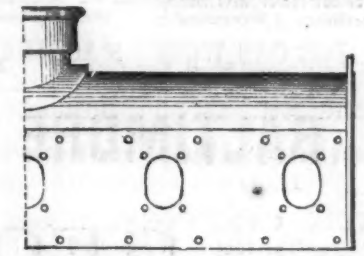

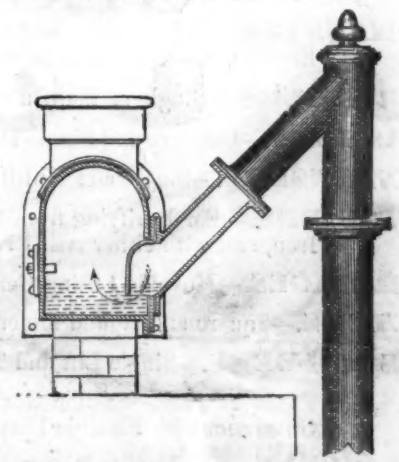

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FOR BENCHES OF 1, 2, 3, 5 and 6 RETORTS.

By the removal of the front plate only the Main can adopted to Settings of any number of Retorts desired. Th Patent Main can be applied to the ordinary D shaped Main It offers great facilities for cleaning, and is not liable stoppage.

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Fredonia, N. Y.
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National Asylum for Discharged Volunteer Soldiers, Milwaukee, Wis.

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La Porte, Ind.
Lawrence, Kansas.
Salem, Oregon.
Port-au-Prince, Cal.
San Jose, Cal.
Stockton, Cal.
Illinois State Penitentiary, Joliet.
Hartford, Conn.
Hagerstown, Md.
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Elkton, Md.
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Augusta, Ga.
New Orleans, La.
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